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FRANCE TELECOM, S.A.

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

France Telecom, S.A.,

Plaintiff,

vs.

Marvell Semiconductor, Inc.,

Defendant.

Case No. 3:12-cv-4967-WHA (NC)

PLAINTIFF'S OPENING CLAIM CONSTRUCTION BRIEF

Date: July 24, 2013
Time: 1:30 p.m.
Place: Courtroom 8, 19th Floor, San Francisco Courthouse
Judge: Hon. William H. Alsup

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I. INTRODUCTION

The five claim terms that defendant Marvell Semiconductor Inc. ("Marvell") is asking the Court to construe have well-understood meanings to those skilled in the art and are clearly defined and explained in the specification of U.S. Patent No. 5,446,747 ("the '747 Patent"). Despite this, Marvell has proposed claim constructions that introduce terminology with no basis in the '747 Patent and that, in most cases, conflict with the '747 Patent's very description of the invention. Marvell's motivation for doing so is simple. First, Marvell seeks to introduce "block coding" terminology to position itself to rely on prior art from that technology even though the patent is clearly directed to a different type of coding, "convolutional coding." Second, it seeks to define certain terms to exclude the preferred embodiment shown in Figure 1 of the '747 Patent because that figure is incorporated in the 3G standards that Marvell admittedly complies with in building its chips. The Court should not countenance these transparent attempts to distort the patent claims in a manner that excludes the invention itself and instead sweeps in other technologies it was never intended to cover.

The '747 Patent discloses and claims methods, commonly referred to as "turbo codes" or "turbo coding," for correcting errors in telecommunications (and other) transmissions. Claim 1 covers a turbo code encoding method, and Claim 10 covers a turbo code decoding method. One term, "data element," appears in both Claim 1 and Claim 10. Three terms, "convolutional coding," "systematic convolutional coding," and "at least two independent and parallel steps of systematic convolutional coding," appear only in Claim 1. The fifth term, "iterative decoding procedure," appears only in Claim 10.

France Telecom contends that these terms generally do not require construction because they each have a plain meaning that is well understood by those skilled in the art, but in the event the Court determines construction is necessary, France Telecom has advanced alternative constructions that are taken directly from the specification and match the terms' plain meanings. France Telecom's alternative constructions are fully consistent with the perspective of a person of ordinary skill in the art reading the entire '747 Patent, which is a "fully integrated written instrument," including the specification, claims, and prosecution history. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 978 (Fed. Cir. 1995), *aff'd*,

517 U.S. 370 (1996)).[1]

II. TECHNOLOGICAL BACKGROUND

Turbo codes are widely understood as having revolutionized the data communications industry and have received widespread recognition as engineering achievements of the highest magnitude. Marvell alone has refused to take a license under France Telecom's patent rights despite the '747 Patent's widespread adoption and acceptance.

In an ideal world, the transmission of data between a transmitter and receiver would flow perfectly without any loss of signal or corruption from "noise"—*i.e.*, interference from other sources which are not part of the data being transmitted. In the real world, however, all transmissions are subject to such noise, which blends in with the transmitted data and corrupts and distorts the integrity of the data received by the receiver. Forward error correction coding minimizes the effect of data-corrupting noise by encoding the transmitted data in the transmitter at the time of transmission, and then decoding that data upon receipt by the receiver. These techniques allow the receiver to recover the originally transmitted message despite its having been corrupted by the presence of noise.

The '747 Patent is a breakthrough, pioneering advance in forward error correction. The method claimed in the '747 Patent is a practical, scalable, high performance technique which is among the closest to approaching the Shannon limit — the theoretical limit of maximum data transfer rate over a noisy channel. (In information theory, the Shannon Theorem provides the maximum rate at which information can be transmitted over a communication channel of a specific bandwidth in the presence of noise.) Until the turbo codes of the '747 Patent were developed, it was thought to be very difficult or even impossible for any forward error correction coding method to approach the Shannon limit. But because turbo codes can achieve this goal, the coding method claimed in the '747 Patent can increase data rate transfer capability without increasing the required power for transmission and, conversely, decrease the amount of power required to transfer data at a given data rate, enabling high-speed wireless communication at low power, as required for 3G and higher mobile communications.

[1] France Telecom contends that it would be entitled to summary judgment in its favor on the issues of infringement and Marvell's prior art based defenses regardless of whether the Court adopts France Telecom's or Marvell's proposed constructions.

Instead of a (single) encoder at the transmitter and a single decoder at the receiver, turbo coding uses at least two parallel encodings at one end and an iterative decoding procedure at the other. As the ’747 Patent explains, the two “parallel” concatenated encodings work synergistically. When a message is transmitted, each element of the message is transmitted three times: once (systematically) as an uncoded element; a second time, by encoding the message element with a convolutional coder to generate a coded element; and a third time, by modifying the order of elements of the original message in an interleaver and then encoding the result in a convolutional coder to generate another coded element. The modifying the order of elements by the interleaver adds a degree of randomness between the two encodings that helps separate the effects of noise, making it less likely that any burst of noise corrupting an element generated by one encoding will corrupt the corresponding element generated by the other encoding. Asserted Claim 1 of the ’747 Patent covers such a method for turbo code encoding.

At the decoding end, the decoding of data encoded according to the coding method of Claim 1 is done iteratively. This iterative procedure allows the decoder to successively improve results as it refines the decoding results after each iteration. In addition, the availability of two systematic convolutional coding streams, presented in different order by virtue of the interleaver, can help the turbo code decoder synergistically improve its determination of the original, uncoded message. Just as solving the rows of a crossword puzzle helps solve the columns and vice versa, the decoder is designed to iteratively decode each element from the parallel encoded streams of the message and compare results until it converges on a solution: the more comparisons, ideally, the better the results. Asserted Claim 10 of the ‘747 Patent covers a method for turbo code decoding.

The benefits of the coding and decoding methods claimed in the ‘747 Patent are illustrated in the series of figures set forth below. The first figure shows an image decoded on a receiver that was digitally transmitted without coding according to the ‘747 Patent (0.0); the second figure shows the same image transmitted with encoding according to Claim 1 of the ‘747 Patent and one iteration of decoding according to Claim 10 of the ‘747 Patent (1.0); and the final figure shows the image transmitted with encoding according to Claim 1 of the ‘747 Patent and eight iterations of decoding according to Claim 10 (8.0).

The invention embodied in the ‘747 Patent is universally regarded as a technological breakthrough of the first order and the invention has received numerous prestigious awards. For example, turbo code technology was recognized in 1998 with an IEEE Information Theory Society Golden Jubilee Award, which is given for “inventions that have had a profound impact in the technology of information transmission, processing and compression.” In 2003, the IEEE Richard W. Hamming Award was bestowed “[f]or the invention of turbo codes, which have revolutionized digital communications.” In 2005, Claude Berrou, the inventor of the ‘747 Patent, was recognized with a Marconi Prize Fellowship for inventing turbo codes, thereby solving a data communications puzzle that had evaded researchers for 40 years.[2] In 2006, Prof. Berrou was nominated for the European Patent Office’s first ever European Inventor of the Year Award for the turbo code invention from among all inventors who were granted patents by the EPO from 1991 to 2000. In January 2007, Prof. Berrou was elected as a new member of the French Academy of Sciences (“Académie des Sciences”). Be-

[2] The Marconi Prize is an annual award recognizing achievements and advancements in communications. Besides Prof. Berrou, recent recipients of the Marconi Prize include Tim Berners-Lee in 2002 for the invention of the world wide web, Robert Metcalfe in 2003 for the invention of the Ethernet, Sergey Brin and Larry Page in 2004 for the development of information retrieval technology (i.e., Google), John Cioffi in 2006 for the invention of DSL, and Ronald Rivest in 2007 for public-key cryptography and other lasting contributions to human progress. *See* “The Marconi Society: Fellows,” *available at* http://www.marconifoundation.org/index.html (last accessed June 10, 2013).

cause of its efficiency and performance, all third-generation ("3G") telecommunications standards such as, for example, the 3GPP and 3GPP2 Standards, have adopted and implemented the '747 Patent's error-correction coding method.

The invention of turbo codes led to a new standalone academic field of research with its own international conferences and symposiums. For example, in August, 2012 the ISTC 2012 (International Symposium for Turbo Codes) took place in Gothenburg, Sweden as the Seventh International Symposium dedicated to Turbo Codes, where the top researchers in this field were present with Claude Berrou to celebrate the twentieth anniversary of his invention.

III. THE APPLICABLE LEGAL STANDARDS

The meaning of disputed claim terms is determined from the perspective of one of ordinary skill in the art at the time the patent was filed. *See Chamberlain Group, Inc. v. Lear Corp.*, 516 F.3d 1331, 1335 (Fed. Cir. 2008). The intrinsic record provides the primary resource for construing claim terms. Claim terms "are generally given their ordinary and customary meaning," thus the "claims themselves provide substantial guidance as to the meaning of particular claim terms." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-15 (Fed. Cir. 2005) (en banc). Moreover, the Court must construe the claim's words "in light of the intrinsic evidence of record, including the written description, the drawings, and the prosecution history." *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 711 F.3d 1348, 1360 (Fed. Cir. 2013). Consequently, the patent's specification "is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). In addition, where relevant, the patent's prosecution history "can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim narrower than it would otherwise be." *Phillips*, 415 F.3d at 1313.

The Court may also consider extrinsic evidence, including dictionaries, treatises, and testimony from experts. However, such evidence is "less significant than the intrinsic record in determining the legally operative meaning of claim language." *Id.* at 1317-18. In essence, however, "[t]he construction that stays true to the claim language and most naturally aligns with the patent's descrip-

tion of the invention will be, in the end, the correct construction." *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998). Thus, where the '747 patent specification itself explicitly defines the term in question, that definition controls. *See, e.g., Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1380 (Fed. Cir. 2009).

IV. ARGUMENT

A. "convolutional coding"

France Telecom's Proposed Construction	Marvell's Proposed Construction
No construction necessary, *or if the Court concludes construction is necessary,* "codes that associate to each source data element at least one coded data element which is a combination of the source data element and at least one previous source data element"	"calculating an output data element representing current input data using current and prior input data"

Convolutional coding is one of the principal types of prior art error-correcting coding. A person of ordinary skill in the art at the time of the invention of the '747 Patent would readily recognize that convolutional coding is one of "two different types of codes in common use today," the other type being block coding. (*See* Declaration of Richard Koehl (hereafter "Koehl Decl."), Ex. 2 at FT004445.) *See, e.g., Phillips*, 415 F.3d at 1313 ("[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention."). Marvell is asking the Court to redefine "convolutional coding" so that it can raise block coding references, and other non-convolutional coding references, in an attempt to argue that the '747 Patent is obvious. France Telecom submits that a lay jury will readily understand fact and expert testimony that block coding is not convolutional coding, just as well as it can understand that a propeller is not a jet, even in the absence of a construction.

Marvell's plan to redraft the claim language cannot succeed in any event, however, because the '747 Patent specification itself explicitly defines the term "convolutional coding." That explicit definition is controlling here. *See Network Protection Sciences, LLC v. Fortinet, Inc.*, No. C 12-01106 WHA, 2013 WL 146033 at *6 (N.D. Cal. Jan. 14, 2013) ("When a patentee explicitly defines a claim term in the patent specification, the patentee's definition controls.") (citing *Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1380 (Fed. Cir. 2009)); *Oracle Am., Inc. v. Google Inc.*, No. C 10-03561 WHA, 2012 WL 243263 at *2-*3 (N.D. Cal. Jan. 25, 2012) ("The claim draf-

ter acted as his own lexicographer when he expressly defined the phrase."); *see also Phillips*, 415 F.3d at 1321 ("[T]he specification 'acts as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication.'") (collecting cases). In particular, the '747 Patent specification states:

> Convolutional codes are codes that associate at least one coded data element with each source data element, this coded data element being obtained by the summation modulo 2 of this source data element with at least one of the preceding source data elements. Thus, each coded symbol is a linear combination of the source data element to be coded and of previous data source elements taken into account.

'747 Patent, 1:46-53. Accordingly, France Telecom proposes the following definition for the term "convolutional coding": "codes that associate to each source data element at least one coded data element which is a combination of the source data element and at least one previous source data element." As in *Network Protection Services*, France Telecom's proposed construction condenses the specification's explicit definition into a compact form more suitable for a jury but stays true to, and closely follows, the express language of the specification. *See Network Protection Sciences*, 2013 WL 146033 at *5 ("NPS' proposed constructions are reworded versions of this definition.").

Marvell's proposed construction, by contrast, mangles the specification's explicit definition. Marvell interjects new words and phrases that are found neither in the precisely written claims, nor in the '747 Patent's explicit definition. Instead of a "source data element," which the patent uniformly discusses as a singular, specific datum in a message to be coded, Marvell refers loosely to "current" and "prior" "input data," which are plural, vague and could be anything. Instead of "a combination," Marvell refers generally to "calculating" and "using." Instead of "associating," Marvell refers loosely to "representing." There is no need for the Court to consider Marvell's specious proposal. Because "the patentee's definition controls," Marvell's attempt to rewrite the definition must be rejected. *See Network Protection Sciences*, 2013 WL 146033 at *6-*8.

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B. "systematic convolutional coding"

France Telecom's Proposed Construction	Marvell's Proposed Construction
No construction necessary, *or if the Court concludes construction is necessary,* "convolutional coding in which the source data elements are transmitted jointly with coded data elements"	"convolutional coding where the output includes both the coded data and the current input data"

The parties apparently do not dispute that in "systematic" coding, in addition to transmitting the coded data elements generated by an encoder, copies of the uncoded source data elements are also transmitted. The dispute between the parties is whether a systematic convolutional coding step provides the uncoded source data elements *jointly with* the coded data elements output by the convolutional encoding (as France Telecom contends), or whether these systematically transmitted source data elements[3] must be *included* within the output of, and output separately from, each of the convolutional coding steps (as Marvell proposes). Marvell apparently seeks to argue that the preferred (and indeed only) embodiment shown in the patent, which provides two parallel systematic convolutional coders whose output coded data elements (Y_1 and Y_2) are systematically transmitted with the uncoded data element (X), is not covered by Claim 1 of the '747 Patent—and, accordingly, since Marvell's chips follow the 3G standards to do what is shown in Figure 1 of the patent, they also do not infringe. The specification, however, "is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." *Phillips*, 415 F.3d at 1315 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir.1996)). If Marvell's construction were adopted,

> a preferred (and indeed only) embodiment in the specification would not fall within the scope of the patent claim. Such an interpretation is rarely, if ever, correct and would require highly persuasive evidentiary support, which is wholly absent in this case.

See Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1583-84 (Fed. Cir. 1996); *Conceptus, Inc. v. Hologic, Inc.*, No. C 09-02280 WHA, 2010 WL 1222771 at *9 (N.D. Cal. Mar. 24, 2010) (citing same); *Geo. M. Martin Co. v. Alliance Mach. Sys. Int'l, LLC*, No. C 07-00692 WHA, 2007 WL 4105832 at *4 & n. (N.D. Cal. Nov. 16, 2007); *Affymetrix, Inc. v. Multilyte, Inc.*, No. C 03-03779 WHA, 2005 WL 6220111 at *11 (N.D. Cal. Feb. 22, 2005); *Siliconix Inc. v. Alpha & Omega Semiconductor Inc.*, No. C 03-4803 WHA, 2004 WL 5645572 at *2 (N.D. Cal. Sept. 10, 2004); *accord*

[3] Or, according to Marvell, some other so-called "current input."

Adams Respiratory Therapeutics, Inc. v. Perrigo Co., 616 F.3d 1283, 1290 (Fed. Cir. 2010) ("Claim terms are not construed in a vacuum divorced from the specification."); *SEB SA v. Montgomery Ward & Co.*, 594 F.3d 1360, 1369 (Fed. Cir. 2010) ("[W]ith the preferred embodiment showing a vertical stabilizing screw, the 'completely free' limitation cannot be read so broadly as to exclude this preferred embodiment."), *aff'd*, 131 S. Ct. 2060 (2011); *Chimie v. PPG Indus., Inc.*, 402 F.3d 1371, 1377 (Fed. Cir. 2005) ("Because a literal construction of the term 'dust-free and non-dusting,' which PPG advocates to mean 'no dust cloud whatsoever,' would not read on the preferred embodiment, we agree with the district court that a person of ordinary skill in the art would not interpret this term in that manner."). Because Marvell's proposed construction would exclude every embodiment of Claim 1 described in the specification, it must be rejected.

France Telecom's construction is fully consistent with the claim language and with the specification's description of the turbo code encoding invention. The '747 Patent specification repeatedly explains that in systematic coding the source data elements are regularly and methodically transmitted alongside the coded data elements. For example, in the principal embodiment, "a data element X, equal to the source data element d, is transmitted systematically." '747 Patent, 8:12-14; *see also id.*, 8:38-39 ("The data element X_k is systematically taken to be equal to the source value d_k.") Likewise, the at least two coding modules in this embodiment use codes "characterized by the fact that the source data element is transmitted, systematically, jointly with at least one coded data element or redundancy symbol." *Id.*, 8:20-22.

Notably, the specification explains that in systematic coding the uncoded source data elements may be transmitted only once and ***shared*** by both outputs. *See id.*, 3:32-35 ("The redundant codes used are of a systematic type. Each source data element is therefore also a convolutional coding symbol, and this symbol is shared by both codes.") In other words, "systematic" is clearly described in the specification to mean the transmission of the source data element (X) jointly with coded data element (*e.g.,* Y_1 and Y_2) output from each of the coding steps. This aspect of the principal embodiment is shown graphically in Figure 1 of the patent specification, reproduced below with explanatory color and legends added:

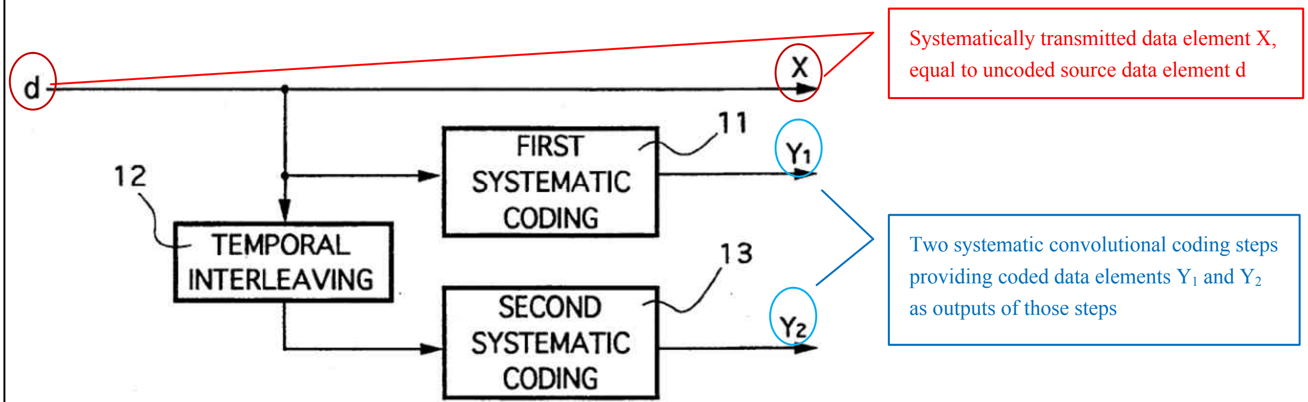

Fig. 1

As can be seen, Figure 1 shows modules 11 and 13 and identifies them as "FIRST SYSTEMATIC CODING" and "SECOND SYSTEMATIC CODING." The corresponding text in the specification states that modules 11 and 13 "may be of any known systematic type" and "are advantageously convolutional coders." *See* '747 Patent, 7:60-63. The two systematic convolutional coders 11 and 13 receive uncoded source data elements d as inputs, *see id.*, 7:50-53, and output coded data elements Y_1 and Y_2, respectively. *See id.*, 7:54-57. Although each source data element d is input, it is not output separately from modules 11 and 13 in Figure 1 but is instead "transmitted systematically," regularly and methodically, as "data element X," "jointly with" coded data elements Y_1 and Y_2. *See id.*, 8:12-22.

In accordance with the overall plan of Figure 1, Figure 7 (which shows how coding modules 11 and 13 in Figure 1 may be built) shows that a coding module *can* take an input source data element d_k and output it as data element X_k, but it does not *need* to if X_k can be obtained elsewhere. *See* '747 Patent, Fig. 1 (showing line from d to X). The specification further explains that the point of Figure 7 is to explain how the coded data element Y_k is output by the module. "The essential characteristic of the invention is indeed that of determining the coded value of Y_k." *Id.*, 8:46-47.

Crucially, France Telecom's definition adheres to the "substantial guidance" provided by the claims themselves. *See Phillips*, 415 F.3d at 1314. The context in which "systematic convolutional coding" appears is "highly instructive" here. *See id.* Claim 1 ***requires*** that at least two systematic convolutional coding steps "provid[e] parallel outputs of distinct series of ***coded*** data elements," but Claim 1 and its dependent claims are ***silent*** as to whether the input, ***uncoded*** source data elements

are also provided as outputs of the systematic convolutional coding steps. Marvell's requirement that "the output includes . . . current input data" finds no footing in the language of Claim 1 or any dependent claim, and must fall.[4]

Accordingly, in response to Marvell's request to construe the term "systematic convolutional coding," France Telecom has proposed the construction "convolutional coding in which the source data elements are transmitted jointly with coded data elements." France Telecom's proposed construction (1) is true to the claim language and (2) closely follows the specification. *See Renishaw*, 158 F.3d at 1250.

Marvell's proposed construction, in contrast, would exclude *every* embodiment of the encoding invention claimed in Claim 1. Requiring each step of systematic convolutional coding output "the current input data," as Marvell proposes, conflicts with "what the inventors actually invented and intended to envelop with the claim" and therefore cannot be correct. *See Phillips*, 415 F.3d at 1316 (citing *Renishaw*, 158 F.3d at 1250); *Vitronics Corp.*, 90 F.3d at 1583-84 ("a preferred (and indeed only) embodiment . . . would not fall within the scope of the patent claim. Such an interpretation is rarely, if ever, correct").

Marvell apparently contends that the turbo code encoding method of Claim 1, which requires implementing "at least two" steps of systematic convolutional coding, requires that each of these steps transmit a separate copy of the input source data element. In essence, Marvell apparently contends that if Figure 1 corresponds to Claim 1, it should show an X output from box 11 and an X output from box 13 (and no X obtained directly from d). But, as explained above, Claim 1 imposes no such requirement. Claim 1 only requires that the (at least two) systematic convolutional coding steps "provid[e] parallel outputs of distinct series of coded data elements"—in the case of Figure 1, the coded data elements Y_1 and Y_2. Claim 1 does not require that the (at least two) systematic convolutional coding steps directly output copies of the source data element X.

Marvell's construction completely contradicts the description of the turbo code encoder em-

[4] Claim 1 nevertheless permits data element X to be obtained from any appropriate copy of source data element d. For example, the source data element d_k input into Figure 7 can be output as data element X_k when appropriate—for example, data element d_k can be provided as an output data element X_k from *one* systematic convolutional coding step, *see* '747 Patent, Fig. 7, but *not* output from the *other* coding step. Here, again, France Telecom's construction is consistent with Claim 1, but Marvell's is not.

bodied in Figure 1 (and in every other embodiment of the method described in the '747 Patent). Figure 1 "is a block diagram illustrating the basic principles of the coding method of the invention, called 'parallel concatenation' coding." '747 Patent, 7:8-10. Even though Figure 1 shows an encoding method in which the uncoded, transmitted source data element X can be ***shared*** between the two systematic convolutional coders, so that it is only transmitted once for each data element in the message, and even though this sharing also is stated expressly in the '747 Patent specification at 3:32-35, Marvell's proposal forbids sharing. Inefficiently, Marvell requires that each input source data element be transmitted ***twice***, once as part of each coding step. That is incompatible with the invention's stated aim of providing "particularly efficient" methods for transmission in noisy channels. *See id.*, 2:39-42. Each source data element d of the message would result in a total of *four* data elements being sent—two "X"s, a "Y_1" and a "Y_2"—resulting in an overall coding efficiency rate of 1/4. That would be no better than the prior art. *See id.*, 3:36-44 (explaining that use of two coders with efficiency rate 1/2 in the invention gives an overall efficiency rate of 1/3 instead of the prior art's rate of 1/4).[5] Because the turbo code decoder cross-checks the sequences of "X"s against *both* the "Y_1"s and the "Y_2"s in order to arrive at a decision as to the true sequence of source data elements (the "d"s), Marvell's proposal also conflicts with the invention's stated aim of "permitting highly reliable decoding of the received data." *See id.*, 2:43-46, 8:12-15 ("In the embodiment shown in FIG. 1, a data element X, equal to the source data element d, is transmitted systematically. This is a feature necessary for the making of the decoding modules as described further below.").

Figure 2 of the '747 Patent, corresponding to dependent Claims 2 and 3, also embodies Claim 1 but would be excluded by Marvell's proposed construction. *See generally* '747 Patent, 9:15-10:17 (describing Fig. 2). Figure 2 closely resembles Figure 1. It adds only a "selection module 15" that "carries out a

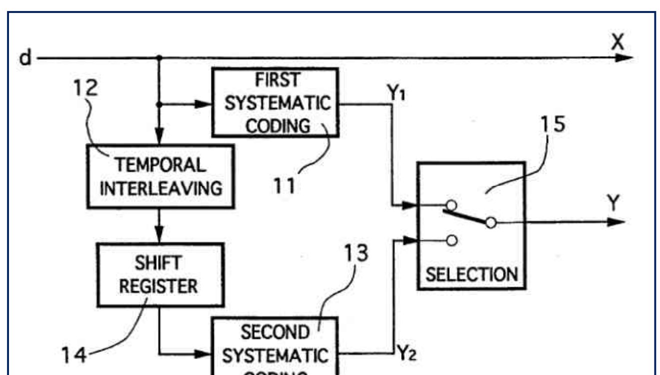

Fig. 2

[5] Under France Telecom's proposal, each source data element d of the the message would result in a total of *three* data elements being sent—an "X", a "Y_1" and a "Y_2"—resulting in an overall coding efficiency rate of 1/3, in agreement with 3:36-44.

periodic switching between the outputs Y_1 and Y_2." *See id.*, 9:31-33; *cf. id.*, Claim 3. Because of the periodic switching, only one sequence of coded data element symbols Y, "equal either to the value Y_1 coming from the first coding module 11 or to the value Y_2 coming from the coding module 13," is ultimately transmitted. *See id.*, 9:29-31; *cf. id.*, Claim 3. But just as in Figure 1, and consistent with France Telecom's construction but inconsistent with Marvell's, the "symbol X" in Figure 2 is not output separately from coding modules 11 or 13 but instead is sent once jointly with those outputs and ***shared***: it "is systematically taken to be the source data element d." *See id.*, 9:26-27.

Because France Telecom's construction, first, "stays true to the claim language," and, second, "most naturally aligns with the patent's description of the invention," it is, "in the end, the correct construction." *See Renishaw*, 158 F.3d at 1250; *see also Phillips*, 415 F.3d at 1316 (citing same).

C. "at least two independent and parallel steps of systematic convolutional coding"

France Telecom's Proposed Construction	Marvell's Proposed Construction
No construction necessary, *or if the Court concludes construction is necessary,* "at least two steps of systematic convolutional coding that are performed in parallel rather than in series, including without limitation as shown in Figures 1 and 2"	"at least two separate and distinct steps of systematic convolutional coding, not in series, simultaneously carried out"

Marvell is asking the Court to construe this phrase so that Marvell can rewrite and interpose spurious limitations into Claim 1. But the phrase "at least two independent and parallel steps of systematic convolutional coding" needs no construction. It is well within the comprehension of a lay jury to understand that this phrase requires (a) at least two steps of (b) systematic convolutional coding that are (c) independent and (d) parallel. *See Finjan, Inc. v. Secure Computing Corp.*, 626 F.3d 1197, 1207 (Fed. Cir. 2010) (finding "no error" in adopting the construction "plain and ordinary meaning"); *Network Protection Sciences*, 2013 WL 146033 at *4-*5 (construing "session" as "plain and ordinary meaning" because "it was a straightforward term in 1994 (and today)"); *EIT Holdings LLC v. Yelp!, Inc.*, No. C 10-05623 WHA, 2011 WL 5038354 at *4 (N.D. Cal. Oct. 24, 2011) ("The patent used the term ['reference'] generally to mean something that refers to something else. This plain meaning will be apparent and understandable to a lay jury."). If the Court concludes that this phrase should be construed, however, France Telecom's alternative proposal is true to the claim lan-

guage, specification, and prosecution history.

The invention of the ’747 Patent aims to provide coding methods “that are particularly efficient,” including an encoding method “that has a very high coding efficiency rate,” and enables “the coding and decoding of data at very high bit rates.” *See* ’747 Patent, 2:39-42, 2:47-49, 2:58-60. These aims “are achieved according to the invention” by a method that “implement[s] in parallel at least two independent steps of systematic convolutional coding.” *Id.*, 3:15-20.

To help understand the invention, the ’747 Patent explains that prior art “series concatenation” encoding methods “plac[e] several coders in series . . . [T]he data elements coded by a first coder feed a second coder which ‘overcodes’ these data elements.” *Id.*, 1:58-61. The decoding method “is obviously done symmetrically, in starting with the second code.” *Id.*, 1:62-63. But daisy-chaining coders to serially overcode the data is inefficient because each layer of coding slows down the rate at which information is transmitted. *See id.*, 1:65-2:2. The ’747 Patent discloses and claims a “parallel concatenation” solution distinguished specifically from the prior art “series” solution:

> This method, hereinafter called method of “parallel concatenation” coding, by contrast with the standard technique of “series concatenation” described in the introduction, makes it possible, during the decoding, to have available symbols coming from two distinct decoders.
> The redundant codes used are of a systematic type. Each source data element is therefore also a convolutional coding symbol, and this symbol is shared by both codes.

Id., 3:26-35. The “basic principles of the coding method of the invention, called ‘parallel concatenation’ coding,” are illustrated in Figure 1. *Id.*, 7:8-10 & Fig. 1. Boxes 11 and 13 in the figure, marked “FIRST SYSTEMATIC CODING” and “SECOND SYSTEMATIC CODING,” represent two steps of systematic convolutional coding. Figure 1 illustrates, and the specification explains, that they encode independently and operate in parallel.

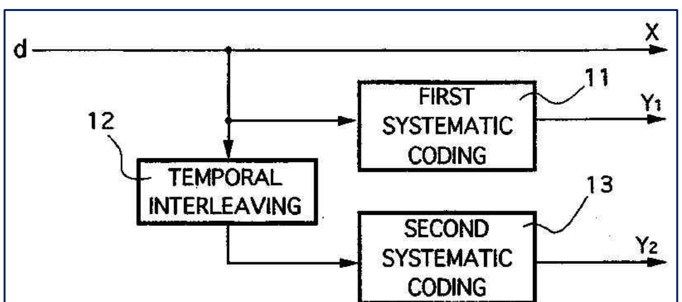

Fig. 1

> Each source data element d to be coded is directed, firstly, towards a first coding module 11 and, secondly, towards temporal interleaving module 12 which itself feed[s] a second coding module 13.

> According to this method, it is seen, therefore, that there are at least two coded data elements Y_1 and Y_2, coming from distinct coders 11 and 13, associated with each source data element. It is clear that the number of coders, limited herein to two, can easily be increased according to the same principle.

Id., 7:50-59.

Therefore a person of ordinary skill in the art who reads the claims and specification will understand that "at least two independent and parallel steps of systematic convolutional coding" means just what it says it means: at least two steps of systematic convolutional coding that are (1) not dependent on one another (unlike the prior art methods in which "the data elements coded by a first coder feed a second coder," '747 Patent, 1:60-61) and (2) are configured in parallel (as is readily apparent in Figures 1 and 2 and as explained in the specification). This straightforward, plain meaning "will be apparent and understandable to a lay jury," and no construction is necessary. *See EIT*, 2011 WL 5038354 at *4.

Marvell's proposed construction is not true to the claim language and attempts to introduce additional claim limitations where none exist. Specifically, Marvell's proposed construction attempts to rewrite the claim language of "independent and parallel" into "separate and distinct" and to introduce a further temporal limitation—*i.e.*, that the two coding steps be "simultaneously carried out".

There is no reason to introduce a "separate and distinct" limitation into the at least two steps of systematic convolutional coding. Claim 1 already requires that each of the at least two coding steps "provid[e] parallel outputs of ***distinct*** series of coded data elements." In other words, Claim 1 requires only that each series of *coded data elements* be "distinct," ***not*** that each *encoding step* be distinct. The prosecution history shows that the patentee chose to claim the coding steps as "independent" and "parallel," while acknowledging that the separately claimed data elements are taken in "distinct" order. (Koehl Decl., Ex. 3 at FT000243-44, Ex. 4 at FT000247). Thus, the patentee clearly understood the words "separate and distinct" but chose not to use them here. It is legal error to import a limitation into the claim when there has been no explicit definition, and no express disavowal, in the specification or prosecution history. *See Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, 1288-89 (Fed. Cir. 2009); *Phillips*, 415 F.3d at 1316, 1323; *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 908 (Fed. Cir. 2004). The patentee's choice to use the claim language should be respected. If there must be a construction, France Telecom's alternative construction respects the patentee's

choice of language and explains that the phrase includes without limitation Figures 1 and 2, as described in the specification, as examples.

Second, the claims, specification, and prosecution history wholly reject the idea that the (at least two) coding steps must be "simultaneously carried out," as Marvell proposes in its construction. Indeed, the specification expressly states that there may be a time delay interposed between the first coding step and second coding step (just after the interleaving step).

> Advantageously, each of said temporal interleaving steps is followed by a delay step, said temporal interleaving step taking account of the source data elements in the order in which said source data elements feed a first coding step and restoring them in a different order to feed a second coding step, said delay step assigning, to each of said source date elements coming from said temporal interleaving step, a delay equal to the latency of decoding of data elements coded by said first coding step.

'747 Patent, 4:6-15.

Furthermore, the existence of dependent Claim 4 renders Marvell's proposed construction untenable. Claim 4 requires: "A method according to claim 1, wherein each of said temporal interleaving steps is followed by a delay step . . . ." Marvell's proposed construction of Claim 1 cannot coexist with Claim 4. This is because, under Marvell's proposed construction, Claim 4 would claim a method wherein both coding steps were "simultaneously carried out" (since Claim 4 is a method according to Claim 1) but also where both coding steps were ***not*** simultaneously carried out because of the delay step limitation added by Claim 4.

Accordingly, while "at least two independent and parallel steps of systematic convolutional coding" is readily understandable to a lay jury and does not require construction, *see EIT*, 2011 WL 5038354 at *4, if the Court determines that the phrase should be construed, France Telecom's alternative construction "stays true to the claim language and most naturally aligns with the patent's description of the invention," and therefore it is, "in the end, the correct construction." *See Renishaw*, 158 F.3d at 1250.

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D. "data element"

France Telecom's Proposed Construction	Marvell's Proposed Construction
No construction necessary, or if the Court concludes construction is necessary, "a single unit of data"	"bits (1 or 0) or series of bits (i.e., a sequence of 1s and 0s) to be considered as a block"

Marvell is asking the Court to construe "data element" so that it can assert an unusually broad range of prior art, including "block coding" prior art. The intrinsic record consistently uses "data element" to mean a single datum—that is, one piece of the plural data. Accordingly, to the extent this term needs construction, France Telecom has proposed to construe "data element" as "a single unit of data." Marvell has proposed a "turgid and unhelpful" definition. *See Network Protection Sciences*, 2013 WL 146033 at *5. Instead of aiding the jury, Marvell's proposal is likely to distract the jury as it considers whether the accused products and the prior art meet the claim limitations.

Asserted Claims 1 and 10 identify six different kinds of data elements: source data elements, coded data elements, received data elements, intermediate data elements, decoded data elements, and estimated data elements. France Telecom submits that the proper focus of the jury should be on the claim language and the specification, and on how the accused products and asserted prior art comport with the various data elements required in each step of Claims 1 and 10. To the extent that a definition of "data element" may be necessary, however, France Telecom's alternative construction of "data element" as "a single unit of data" comports with the term's usage in the claims.

The specification uses "data element" more broadly than as just a bit (a 1 or a 0) or series of bits (1s and 0s). A data element can be a symbol. *See* '747 Patent, 1:51, 1:54, 2:12, 3:30, 3:34, 3:55, 3:56, 3:57, 8:22, 8:23, 9:24-28, 9:34, 10:48, 11:36, 13:10, 13:13. In some cases the data element is known with absolute certainty and can be binary. *See, e.g.,* '747 Patent, 9:24-27, 11:32-33. But in other cases the data element is a "real variable." *See id.*, 11:30-32. Real variables are not binary 0s or 1s; sometimes they can be approximated as "samples coded on n bits," but they do not have to be. *See* '747 Patent, 11:30-44 (contrasting real variable data elements (X) and (Z) with binary data element (S)), Fig. 5 & 13:59-60 (describing test with "an ideal decoder, working on real variables"). Logarithms of real variable data elements may be taken. *See* '747 Patent, 6:5-12; *id.*, Fig. 4 & 12:49-56, 13:18-32; *id.*, Claim 18. France Telecom's definition is in harmony with each of these usages of

"data element."

Contemporary dictionaries—including both dictionaries relied upon by Marvell—state that a "data element" is "[a]n individual unit of data," "[a] named unit of data," or "[a] uniquely named and defined component of a data definition." (Koehl Decl., Ex. 5 at FT004655, Ex. 6 at MSIFT00040257, Ex. 7 at MSIFT00040285-86.) These all agree with the interpretation of a "data element" as a datum: a single unit of data.

Marvell's 21-word definition, in contrast, provides no insight or aid to the jury. It will actually hinder the jury's consideration of the six different kinds of data elements identified in asserted Claims 1 and 10. And Marvell's definition contradicts every teaching of the Federal Circuit in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). The phrase "bits (1 or 0) or series of bits (i.e., a sequence of 1s and 0s)" ignores symbols, real variables, and logarithms described in the '747 Patent specification as "data elements," as explained above. *Cf.* '747 Patent, Claims 12, 17, 19, 20, and 21 (requiring performance of calculations, including addition, subtraction, multiplication, and division, using data elements). At the same time, because Marvell's definition does not even distinguish between "bits" and a "series of bits," it apparently encompasses both the singular (the *datum*) and the plural (the *data*). Indeed, Marvell's proposal arguably reaches *any* sequence of binary data.

Most importantly, Marvell introduces a spurious requirement that the bits are "to be considered as a block." This additional limitation has no basis in the specification, claims, prosecution history, or extrinsic evidence. While the claims and specification clearly state that the '747 Patent makes use of convolutional coding, another major type of coding—block coding—was well known in the error-correcting coding art at the time of the invention of the '747 Patent. "There are two different types of codes in common use today, block codes and convolutional codes." (Koehl Decl., Ex. 2 at FT004445.) Even though Claim 1 requires convolutional coding, Marvell's obviousness arguments, as disclosed in their invalidity contentions, rely almost entirely on block coding prior art. Marvell's transparent attempt to formulate a linguistic hook to confuse the jury into believing that block codes are somehow convolutional codes should be rejected by the Court.

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E. "iterative decoding procedure"

France Telecom's Proposed Construction	Marvell's Proposed Construction
No construction necessary, *or if the Court concludes construction is necessary,* "a decoding procedure involving repetition of one or more steps with the goal of achieving successively improved results"	"process for decoding data by repeating the same sequence of decoding steps"

The term "iterative decoding procedure" appears in the preamble of decoding Claim 10. Terms appearing in the preamble generally do not require construction unless they recite essential structure or give life, meaning, and vitality to the claim. *See Am. Med. Sys., Inc. v. Biolitec, Inc.*, 618 F.3d 1354, 1358-59 (Fed. Cir. 2010). Here "iterative decoding procedure" neither recites essential structure nor gives life, meaning, and vitality to the claim. The body of Claim 10 refers to steps occurring "in a first iteration" and "in all subsequent iterations," thereby identifying the iterative decoding procedure and explaining how it is performed. Because deletion of "iterative decoding procedure" would "not affect the structure or steps of the claimed invention," the body of Claim 10 is "structurally complete" without it. *See id.* (citing *Catalina Mktg. Int'l, Inc. v. Coolsavings.com*, 289 F.3d 801, 808 (Fed. Cir. 2002)). The preamble phrase "iterative decoding procedure" "was not clearly added" to overcome a prior art rejection and is "reasonably susceptible to being construed to be merely duplicative of the limitations in the body of the claim." *See id.* (citing *Symantec Corp. v. Computer Assocs. Int'l, Inc.*, 522 F.3d 1279, 1288-89 (Fed. Cir. 2008)). Therefore it is not a separate limitation, and does not require construction. *See id.*

Even if it were not in the preamble, this term would not require construction. The concept of an "iterative decoding procedure" is well within the understanding of a lay jury. Claim 10 is directed to a method for decoding received digital data elements representing source data elements coded according to the coding method of Claim 1. This method comprises an iterative decoding procedure comprising four steps:

> [a] in a first iteration, combining each of said received digital data elements with a predetermined value to form an intermediate data element,
>
> [b] decoding the intermediate data element representing each received data element to produce a decoded data element,
>
> [c] estimating said source data element, by means of said decoded data element, to produce an estimated data element,

> [d] and for all subsequent iterations, combining each of said received data elements with one of said estimated data elements estimated during a preceding iteration.

'747 Patent, Claim 10 (labels [a]-[d] added for ease of reference). The phrase "iterative decoding procedure" does not appear in the body of Claim 10, but the phrases "in a first iteration" and "and for all subsequent iterations" appear in steps [a] and [d], respectively. Claim 10 therefore requires that step [a] be performed once, at the startup or initialization of the process, and that step [d] be performed thereafter until the process is completed. Accordingly, because the order in which these steps must be performed is clear from the plain language of the claim itself, the phrase "iterative decoding procedure" does not require construction. *See Applera Corp. v. Illumina, Inc.*, No. C 07-02845 WHA, 2008 WL 501391 at *5, *8, *10 (N.D. Cal. Feb. 21, 2008) (finding claim concerned "iterative" process, as required by last step "(e) repeating steps (b), (c) and (d) until a sequence of nucleotides in the target polynucleotide is determined," and last step (e) should be construed as "ordinary and plain" meaning because it "requires no construction and may be sufficiently understood by a layperson without any guidance from the Court").

If the Court should conclude that "iterative decoding procedure" requires construction, however, France Telecom's alternative proposal best comports with the intrinsic record and extrinsic evidence.

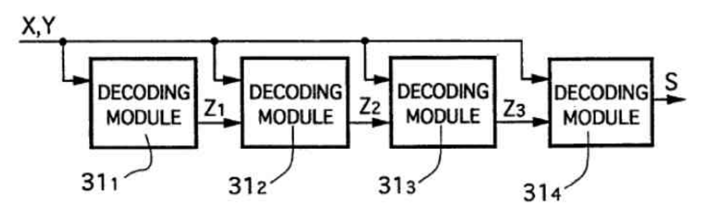

Fig. 3

The plain language of Claim 10 is entirely consistent with the specification, which uniformly describes an iterative decoding method as one of the key aspects of the invention. By daisy-chaining decoding steps together, as shown in Figure 3, and iterating down the chain, the decoding output is successively improved. *See* '747 Patent, 7:14-16 ("FIG. 3 is a block diagram of the basic principle of a modular decoder according to the invention"). As the specification explains, the output of each iteration is fed into the next iteration in order to successively improve the quality of the decoding:

> The decoding method according to the invention shall now be presented with reference to FIG. 3.
>
> This decoding method has the essential characteristic of being iterative. At each iteration, the decoding of at least one intermediate data element is done. Then, using notably the decoded data element, an estimation of the data element to be de-

> coded is determined. During the next iteration, an identical decoding is done on an intermediate data element obtained by the combination of the received data element with the estimated data element. ***If the coding method and the estimation method are well chosen it turns out to be the case, as shall be seen further below, that the decoding quality is a function of the number of iterations made.*** The essential advantage of this iterative method is that it enables the making of modular decoders. It is indeed possible to define modules decoding 31_1 to 31_4 as illustrated in FIG. 3. Each module carries out an iteration of the decoding method. Thus, by cascading n modules, n iterations of the method are made.

'747 Patent, 10:18-38 (emphasis added). Each iteration is intended to improve the quality of the decoding by correcting errors introduced by noise during transmission. This iterative feedback allows the method to successively approach the Shannon limit, the holy grail of decoding. *See* '747 Patent, 14:24-27 ("it can [be] noted that each module added can be used to improve the quality of the decoding, in approaching Shannon's limit").

The extrinsic evidence uniformly agrees that the plain and ordinary meaning of an iterative decoding procedure is "a decoding procedure involving repetition of one or more steps with the goal of achieving successively improved results." (*See* Koehl Decl., Ex. 8, Ex. 9.) Even Marvell's dictionaries agree with France Telecom—and not Marvell. For example, *Newton's Telecom Dictionary* (3d ed. 1990) states that an "iterative process" is "The process of repeatedly processing a bunch of instructions. Each repetition, theoretically, comes progressively closer to the desired result, the 'correct' answer, etc." (Koehl Decl., Ex. 9; *see also id.*, Ex. 6 (*Newton's Telecom Dictionary* (7th ed. 1994) (same)).)

As with the terms it has asked to construe in encoding Claim 1, Marvell has no good reason to twist the plain language of decoding Claim 10. Instead Marvell is asking the Court to introduce non-infringement and invalidity arguments where they otherwise do not exist. Marvell seeks to require that the process of Claim 10 repeat "the same sequence of decoding steps," but the language of the body of Claim 10 distinguishes between steps that are performed once, "in a first iteration," such as step [a], and steps that are performed "in all subsequent iterations," such as step [d]. The language in the claim body must be respected. *Cf. Applera*, 2008 WL 501391 at *6 (construing term because claim language showed first, initializing step (a) was "only performed once," but steps (b)-(d) occurred in both the first and all subsequent iterations). Marvell's construction also does not include the concept — directed to one of the principal advantages of the invention — that each iteration "can

be used to improve the quality of the decoding," and even approach the Shannon limit. *See* '747 Patent, 14:24-28. Finally, as noted above, Marvell's contemporary extrinsic evidence supports France Telecom's alternative construction over Marvell's.

Accordingly, while France Telecom contends that construction of "iterative decoding procedure" is unnecessary because the claim language already provides sufficient insight into the term for the jury's comprehension, if the Court concludes that this phrase requires construction, France Telecom's alternative proposal is the only one that comports with the intrinsic and extrinsic evidence, and should be adopted.

V. CONCLUSION

To the extent that the Court concludes it needs to construe any of the terms that Marvell has requested for construction, the Court should adopt France Telecom's proposed constructions.

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